Director of
Central
Intelligence

~~Top Secret~~

[redacted]

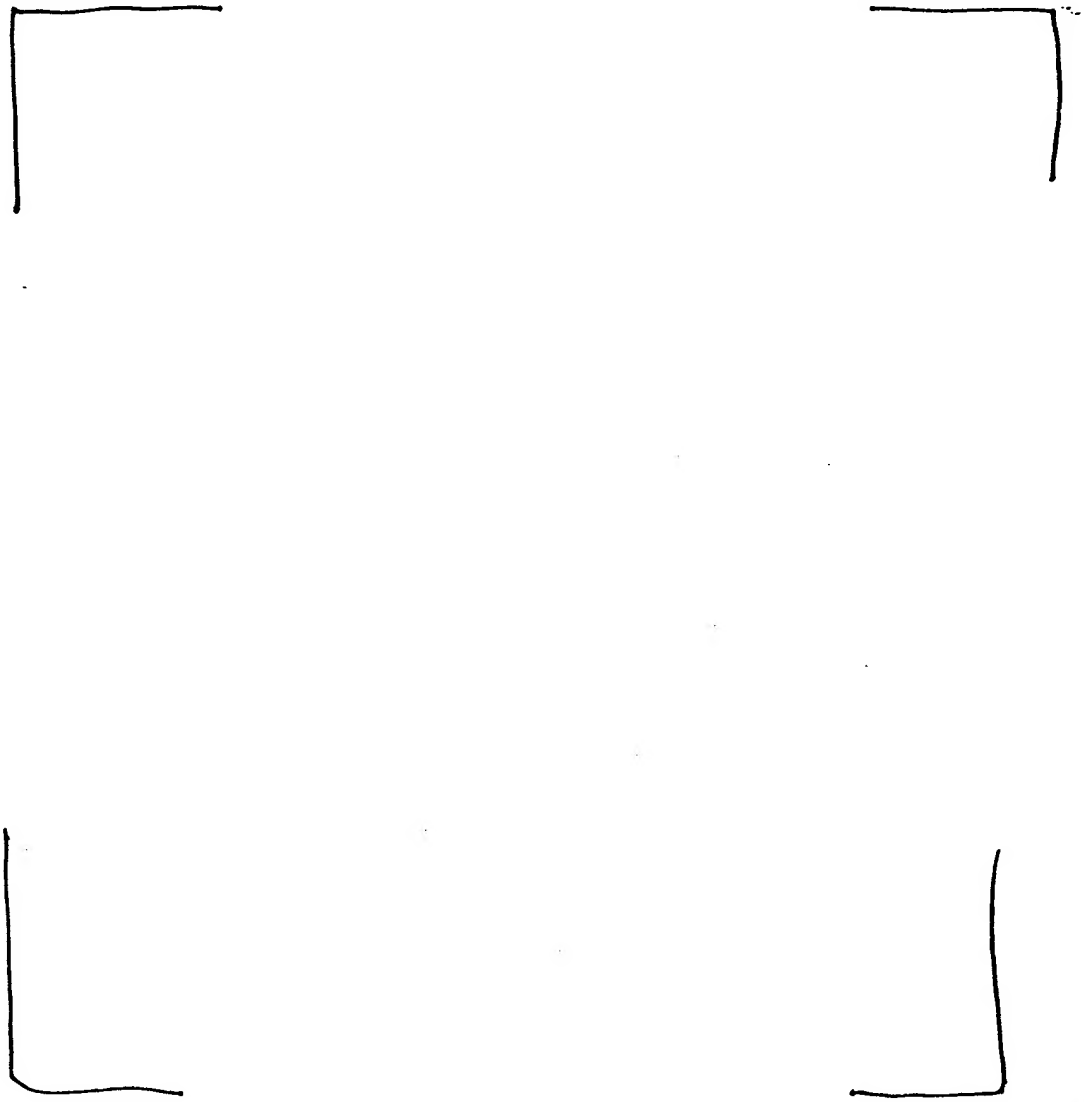
Air Defense of the USSR

Interagency Intelligence Memorandum
Summary

~~Top Secret~~

NI IIM 85-10008
December 1985

Copy 273



NI IIM 85-10008

AIR DEFENSE OF THE USSR

SUMMARY

The full text of this Memorandum is being published separately with regular distribution.

[redacted] Top Secret

SCOPE NOTE

This Memorandum examines current and future Soviet air defense weapon systems, the air defense command structure, the operation of air defense forces, and projects several possible force sizes and rates of modernization. This IIM, however, does not examine the effectiveness of the Soviet air defense system for several reasons. Such judgments are critically dependent on the characteristics of the offensive forces that the air defenses would have to face, some of which were not available to the Intelligence Community for this IIM. Moreover, such judgments are best obtained from large-scale, force-on-force simulations, which allow examination of the synergistic effects on both the offensive and defensive forces. Such analyses are carried out by the Department of Defense. Some general observations about air defense effectiveness are given in NIE 11-3/8-84/85.

This IIM was prepared under the auspices of the National Intelligence Officer for Strategic Programs. Major contributions to the drafting of this IIM were provided by the Defense Intelligence Agency, the Central Intelligence Agency, the National Security Agency, the Foreign Technology Division of the US Air Force, and the Missile and Space Intelligence Center of the US Army.

HIGHLIGHTS

The Soviets will continue a steady modernization, replacing or improving many of their current air defense weapons and support systems with new or modernized systems by the mid-1990s:

— The firepower of Soviet air defenses will grow during the next decade as more capable systems are fielded.

— Soviet ground-based air defenses will become increasingly mobile, thus complicating suppression and avoidance tactics.

The complexity of the air defense task, both in the size of the land area to defend and the continually increasing technology of the aerodynamic threat, forces the Soviets to continually expand and modernize their capabilities. The numbers of military personnel involved and weapon systems deployed for air defense are several orders of magnitude greater than those of any other nation.

The Soviets have undertaken a series of actions intended to enhance their air defense capabilities, including:

— In 1980, reorganizing their air defense command structure for the apparent purpose of increasing its flexibility to maximize the use of all elements of air defense—both strategic and tactical assets—during all phases of conflict. A full understanding of the impact of this reorganization is still developing.

— Making significant upgrades in their control and communications systems to be able to better manage the air battle.

— Deploying the new strategic SA-10 and tactical SA-11 surface-to-air missile (SAM) systems (and soon the SA-X-12) that have improved weapon system characteristics and greater mobility. These systems will provide increased low-altitude capability.

— Increasing the low-altitude capability of their fighter force with continuing deployment of the Foxhound A and Fulcrum A and introduction of the Flanker, all of which have lookdown/shootdown capabilities.

— Developing and deploying new ground-based equipment and airborne systems, particularly the Mainstay Airborne Warning and Control System (AWACS) aircraft for early warning and tracking, which will assist these new weapon systems in attacking low-altitude targets.

These newer, more technologically advanced systems, although expected to be deployed in fewer numbers than older systems, will enhance the Soviets' overall capabilities. We are uncertain, however, about the pace of this modernization effort.

SUMMARY

Introduction

The Soviet Air Defense Forces (Voyska PVO), one of the five Soviet military services, is responsible for the air, ballistic missile, and space defenses of the Soviet Union. Air defense is an essential component of the Soviets' war-fighting strategy, which recognizes that war cannot be won solely by offensive operations. The origin of Soviet air defense dates to the Civil War of 1918-20. The organization of Soviet air defense has undergone numerous, sometimes far-reaching, changes over the years, evolving continually as the air threat increased, until today the Soviets have by far the largest air defense system of any country.

The extensive aerodynamic threat to the USSR ranges from tactical air threats posed by Chinese and NATO units near Soviet borders, to strategic nuclear threats posed by US systems. The Soviets are highly concerned about the challenge to their air defenses from modernization efforts for existing US bombers, the impending deployment of new bombers—the B-1B and eventually the advanced technology bomber—and the large numbers of long-range land-attack cruise missiles.

Mission and Doctrine

The wartime mission of the Soviet Air Defense Forces is to substantially limit damage to Soviet territory. This mission specifically includes:

- Protecting key civilian and military leadership and those support facilities essential to the conduct of military operations.
- Protecting USSR-based military forces.
- Protecting the population and the economy.

To accomplish this mission, the Soviets employ an air defense doctrine, as shown in figure 1, that calls for a defense in depth to impose successive barriers to penetration by enemy aerodynamic threats. This layered defense includes:

- Counterforce strikes.
- Early warning of an attack.
- Offshore detection and tracking by early warning aircraft and ground-based radars, and possibly shipborne radars.
- Forward defenses by fighters using AWACS aircraft and, in some areas, shipborne fighter control, and by shipborne air defense weapons.
- Barrier defense by strategic and available tactical SAMs deployed along the Soviet periphery and anticipated penetration routes.
- Area defenses behind the barriers by fighters and SAMs.
- Terminal defenses for key targets by strategic SAMs and available tactical SAMs and antiaircraft artillery (AAA).

This layered defense is supported with a nationwide ground-based air surveillance and control system consisting of radars and jammers, air controllers, and hardened zonal command and control centers.

A specific approach for cruise missile defense within this overall air defense concept is likely to include attempts to destroy:

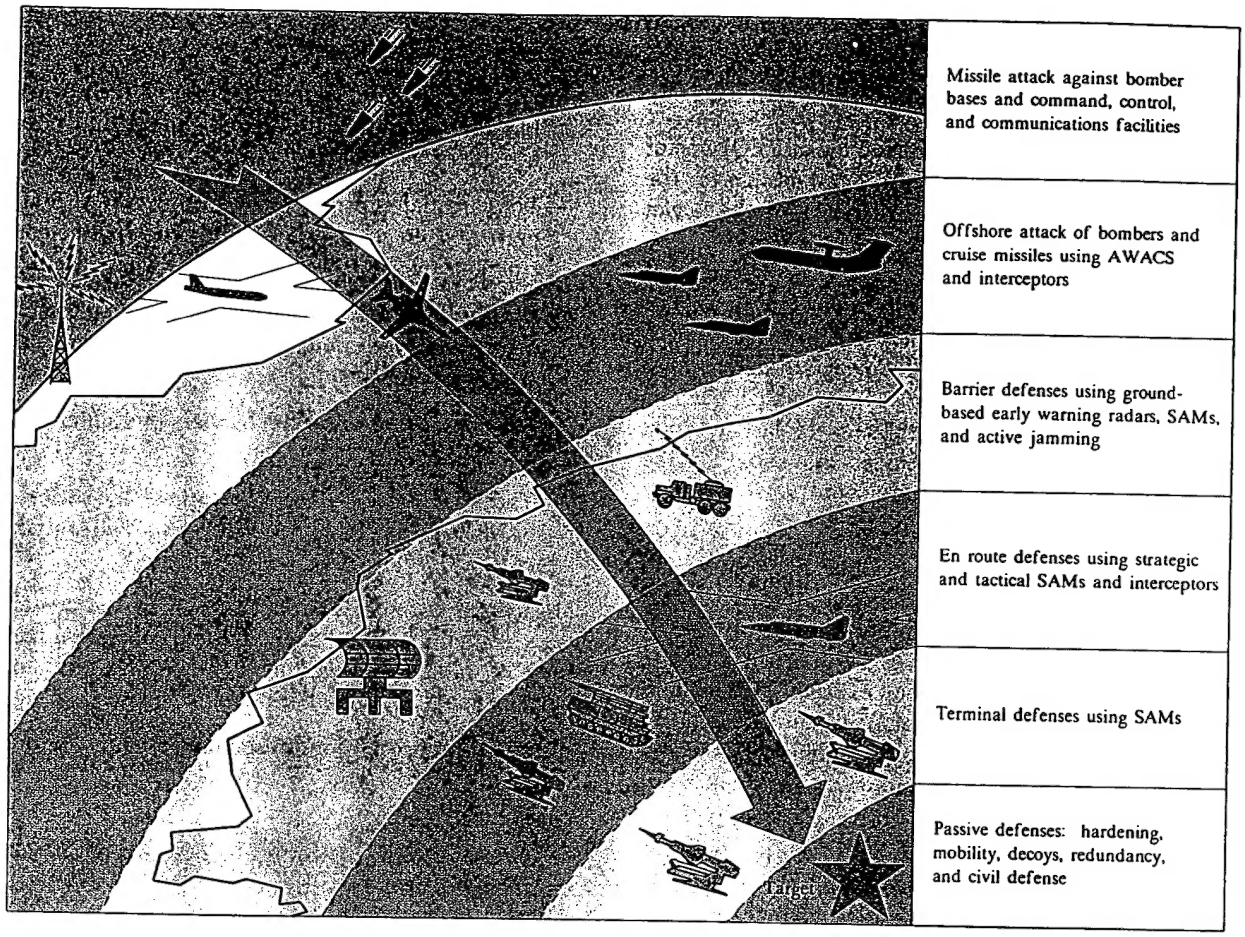
- Cruise missile platforms before they approach the Soviet Union.
- Cruise missile platforms before release of cruise missiles.
- Cruise missiles after launch.

Improvements in Air Defense

During the past decade, the Soviets, through their extensive research, development, and deployment programs, have improved their ability to conduct an increasingly efficient air defense of the USSR. They have made considerable progress overall in:

- Early warning of attacks.
- Passive defenses for the leadership and key workers.
- Modernization and survivability of command, control, and communications facilities.

Figure 1
Soviet Layered Defenses Against Bombers and Cruise Missiles



~~Secret~~
307875 1-86

— Defenses for ground forces.

— Electronic warfare.

— Medium- and high-altitude air defenses overall and low-altitude air defense against aircraft.[1]

They have made some progress and have major programs under way in:

— Air defense against low-altitude cruise missiles.

— Extended-range warning, control, and intercept against aerodynamic systems.

— Passive defenses for the general population.

They have major efforts with potentially high payoffs in:

— Improved conventional weapon systems.

[1] In this IIM, "low altitude" refers to a flight regime in which ground effects (multipath and clutter) are significant considerations in the design of ground-based and airborne radars and of missile guidance seekers. The upper limit of this region varies with terrain roughness and vegetation but could be as high as about 300 meters for rough terrain. (s)

— Directed-energy weapons.

— Improved command and control.

— Improved detection and warning systems.

An alternative view holds that Soviet progress in air defense against low-altitude, low-radar cross section targets is substantially understated in this IIM. In particular, in this view, the SA-10 SAM defenses that encircle Moscow and other cities provide outstanding capability against all classes of targets, with the exception of short-range attack missiles (SRAMs).[2]

Current Soviet Homeland Air Defenses

Detection and Tracking Systems

The Soviets maintain an extensive network for early warning and air surveillance, largely composed of ground-based radars at about 1,250 early warning sites. At least 25 percent of these sites also support colocated ground control intercept (GCI) facilities for directing fighters to their targets. As shown in figure 2, the air defense coverage at medium and high altitudes is virtually complete over the USSR and, in some areas, extends hundreds of kilometers beyond its borders. The coverage against low-altitude targets, however, is limited to high-value target areas and concentrated primarily in the Western USSR.

New Soviet Radars. The Soviets are improving their early warning network by deploying new radars with a three-dimensional—azimuth, elevation, and range—capability. Unlike older radars that could accurately determine only azimuth and range, the newer radars can also determine the altitude of a target. Consequently, these new radars are not required to be deployed with a height-finding radar. We expect one of these new radars, the Tin Shield, to be deployed in large numbers because of its simple design.

Airborne Air Surveillance. The Moss, in operational service since the late 1960s, is basically an airborne early warning (AEW) aircraft and not a true AWACS aircraft, although it has a limited capability to direct intercept operations. The Soviets only built nine Moss aircraft, and their operations were infrequent until about 1982. Future Soviet plans for the Moss are unclear. Two Moss were dismantled in late 1984 and early 1985, but recently one was reassembled. In July 1985 Moss aircraft exercised extensively with the Northern Fleet.

[2] *The holder of this view is the Assistant Chief of Staff for Intelligence, Department of the Army.*

OTH Radars. Voyska PVO operates three large over-the-horizon (OTH) radars with a primary mission of detecting ballistic missile launches, but secondary missions for them are possible, including aircraft early warning. They have sufficient power and operational flexibility to detect airborne targets, although their primary mission in a crisis situation would remain ballistic missile launch detection. They cannot be used simultaneously for both ballistic missile and bomber detection. The Soviets are building a probable new OTH radar, however, that may be more suitable for aircraft early warning.

Passive Detection. The Soviets also have established a passive detection network designed to intercept, and in most cases locate, radar and communications signals as a supplement to their radar network. One of the most recent developments in passive detection has been the deployment of the Czechoslovak-designed Ramona-M in the USSR. It has an estimated range of at least 300 km against high-altitude emitters and reportedly can locate and track from 12 to 20 targets simultaneously.

Command, Control, and Communications

[redacted]

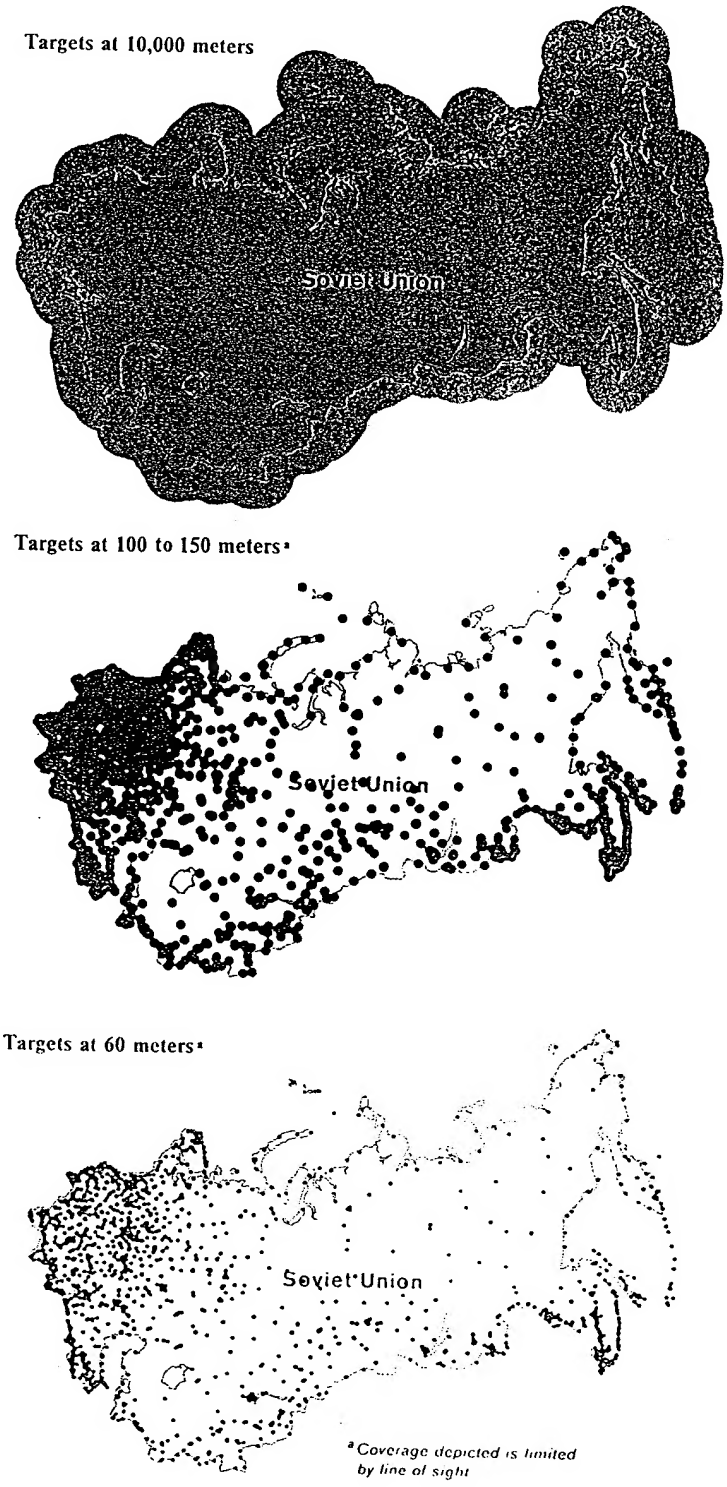
Digital data systems are used for air situation reporting, ground control intercept, and SAM support. These links appear to have slow-to-moderate transmission rates.[redacted]

Air Defense Fighters

There are about 3,250 fighters capable of air intercept missions based at some 90 airfields in the USSR.[3] The primary problem the Soviets face in using their aircraft is the low-altitude threat. About one-third of

[3] This total does not include Floggers and Fishbeds based in the USSR that are subordinate to the Air Armies of the Supreme High Command, and does not include aircraft based outside the USSR.

Figure 2
Current Soviet Air Defense Early Warning Radar Detection and Tracking Coverage Against Bombers and Cruise Missiles



Secret
705616 1-86

the operational Soviet fighters, consisting of older models, have no capability to engage low-altitude targets.

Flogger B/G and Foxbat E have some capability against low-altitude targets and make up over 60 percent of the current Soviet fighter force. They are constrained, however, to rear-hemisphere attacks in the same general altitude region as the target and are usually no higher than 1,000 meters or so above the target. The target is not usually detected below 300 meters. New fighters now being deployed, the Foxhound A and the Fulcrum A, have good low-altitude capabilities but currently make up less than 5 percent of the Soviet fighter force.

Foxhound A. The Foxhound A reached initial operational capability (IOC) in 1981. As of 1 July 1985, the Soviets had deployed about 93 Foxhound As. Its radar is capable of detecting and tracking targets at altitudes [ ]. The Foxhound A radar can track 10 targets simultaneously or attack four targets simultaneously while tracking two others. The Foxhound A is equipped with the AA-9 radar-guided missile, which provides a significant increase in the Soviets' air intercept capability against low-altitude penetrators, including cruise missiles.

The Foxhound A is expected eventually to replace fighters such as the Firebar, the Fiddler, and the Flagon. However, the full capabilities of this system—especially low-altitude intercept—may not be available in the field for some time. Foxhound A training has progressed much more slowly than that of earlier and simpler aircraft—possibly because of the complexities of mastering this system. [ ]

[ ]

Fulcrum A. The Fulcrum A reached IOC in 1984. Its relatively small size and aerodynamic capability make it suited for high-maneuverability air-to-air combat. It has lookdown/shootdown capabilities, but its radar permits the engagement of only one target at a time, although it may be capable of tracking multiple targets. The Fulcrum A will probably be deployed in both homeland air defense and theater roles. As such, it would be suitable to replace older Flagons, Fishbeds, and Floggers that are nearing the end of their operational lives.

Reserves. We have not detected any Soviet reserve fighter units or any organized program from which reserve fighter pilots could be drawn in wartime, although the Soviets have placed many obsolete aircraft in storage. The fighter force could be augmented on a small scale, however, by aircraft flown by instructors and student pilots from training schools.

Strategic SAM Systems

The strategic SAM force committed to the defense of the USSR currently amounts to about 1,200 fire units. Another 575 or so fire units—excluding those operating the infrared (IR) homing systems—belong to the tactical forces and could be used in defense of the USSR.[1]

The Older SAMs. The older strategic SAMs—the SA-1, SA-2, and SA-3—initially deployed in the late 1950s and early 1960s, are characterized by command guidance systems, mechanically scanned radars, somewhat limited electronic counter-countermeasure (ECCM) capabilities, and engagement ranges no greater than 50 km. All of these systems have been modernized over the years to improve their capabilities. As of 1 July 1985, there were about 820 sites using these systems deployed in the USSR.

SA-5. The SA-5 was initially deployed in the late 1960s and provides a long-range intercept capability. Bomber-class targets can be engaged out to 250 to 280 km and small fighter-class targets (1-square-meter radar cross section) out to 120 km. The low-altitude capability of this system [ ]. As of 1 July 1985, a total of 143 SA-5 complexes were deployed or under construction in the USSR, Mongolia, and the non-Soviet Warsaw Pact nations.

SA-10. The SA-10, first deployed in 1980, is a medium-range SAM capable of engaging targets at low-to-high altitude. It has been deployed in a transportable version, the SA-10a, and a mobile version, the SA-10b, is nearing deployment—elements of an SA-10b unit have been seen at a site near Moscow. The

[1] A fire unit generally is defined as the lowest level organization that can independently detect and engage a target. The fire unit for Soviet strategic SAM forces is the battalion (each of which traditionally has been associated with a single SAM site), while the fire unit for the tactical SAM forces is the battery. For some SAM systems, however, such as the SA-8 and SA-11, each transporter-erector-launcher and radar (TELAR) vehicle can operate independently.

SA-10 system can engage up to six targets simultaneously. Each SA-10a site is equipped with a low-altitude acquisition radar, which greatly increases the system's low-altitude capabilities relative to older systems. The SA-10 has been deployed more slowly than earlier SAM systems. As of 1 July 1985, 72 SA-10 sites were operational, with an additional 22 under construction.

Nuclear SAMs. The SA-1, SA-2, and SA-5 systems have a nuclear capability. We judge that the SA-10 also probably has a nuclear capability.

Reserves. Over the years, the Soviets have accumulated a substantial stockpile of retired SAM equipment that we judge will be used to augment defenses, replace damaged or destroyed equipment, or reinforce deploying fronts. We estimate that this equipment, much of it old, is sufficient to outfit about 500 SA-2, SA-3, and SA-5 battalions. We are uncertain about the time it would take to prepare reserve SAM equipment for wartime deployment. Some stored battalions whose equipment is being maintained at the same level as operational battalions could be made operational in one or two days. We believe that most of the equipment is not being maintained frequently and would need spare parts and readiness preparations requiring from several days to weeks.

Tactical SAM Systems

Tactical SAM systems are characterized by their mobility. Although they were designed specifically for defense of the ground forces, they probably will play a role in strategic defense. The older tactical SAMs are the SA-4, a medium-range system, and the SA-6 and SA-8 short-range systems.

SA-11. The SA-11, first deployed in 1983, was designed to combat high-performance aircraft at low-to-medium altitudes. An SA-11 battery can engage six targets simultaneously and has improved ECCM features compared with the older tactical SAMs. The SA-11 has replaced both SA-4s and SA-6s. Although the SA-11 has a shorter range than the SA-4, it has increased mobility, multiple simultaneous intercept capability, and capabilities against cruise missiles.

Infrared SAMs. The Soviets have a number of short-range, heat-seeking SAMs—the man-portable SA-7 and SA-14 and the vehicle-mounted SA-9 and SA-13. We have recently identified another man-portable SAM, known as the Igla, which probably incorporates improvements in speed, maneuverability, and portability. Man-portable infrared SAMs are a standard issue for strategic SAM units.

AAA

There currently are 11,000 pieces of conventional AAA in the USSR, much of which has been organized into SAM/AAA divisions. The primary mission of SAM/AAA divisions apparently is to operate with the ground forces, although they also could be used to protect rear-echelon assets. Some could be used in strategic defense. One of the most effective AAA systems is the ZSU-23/4, which has been deployed for about 20 years. A replacement system, the ZSU-X is in development; compared with the ZSU-23/4, the ZSU-X has almost twice the range.

Naval Forces for Air Defense

Shipborne air defenses are responsible primarily for protecting the ships and, secondarily, for defending naval facilities. Military writings indicate that Soviet naval air defense assets—consisting largely of ship-based SAMs, AAA, and radars—are integrated into the national air defense network in much the same way as land-based tactical air defense resources. We judge that the national air defense authorities will not maneuver naval air defense assets to act as gap fillers in the overall national air defense picture. However, the Soviets plan to use strategic air defense personnel to control overwater operations from ships in selected geographic areas in defense of the Soviet mainland. Further, shipborne air defenses are counted on to extend land-based defenses in those areas, and the Soviets intend to use them as a forward barrier or an advanced early warning network against approaching aircraft or cruise missiles.

Electronic Warfare

Electronic warfare plays a major role in Soviet strategic and tactical air defense operations. The electronic warfare resources devoted to air defense include a combination of systems for jamming of radars, communications, and navigation aids:

- Strategic air defense jamming units are intended to protect important military, political, and economic/industrial targets against air attack and reconnaissance.
- Tactical air defense jamming units have the mission of protecting front and army resources such as key airfields, command posts, lines of communications, and nuclear-capable ground force units from hostile airborne radar reconnaissance, bomb/navigation radars, and attack radars.

Air Defense Operations

Structure and Organization

The Soviet air defense mission has two separate, and potentially conflicting, requirements—strategic defense of key leadership targets, military facilities, and population and economic targets; and tactical defense of such targets as troop formations.

[ ]1980 reorganization of air and air defense forces[ ]

]The key aspects of the structural reorganization involved:

- Resubordination of all tactical air defense SAM, AAA, and air surveillance units from the Ground Forces to Voyska PVO.
- Resubordination of fighters located in the 10 peripheral military districts (MDs) from PVO Strany (now Voyska PVO) to the Soviet Air Forces.

From the information available, we cannot determine how significant and far reaching the impact of this reorganization will be on Soviet air defense capabilities, as we see little change in operations at the lower command levels. On the higher command level, however, the Soviets did create new command elements that could add to their capabilities.

There are a number of advantages of the 1980 reorganization for the Soviets:

- It leaves intact the command of the strategic assets of the Independent Air Defense Armies and the Moscow Air Defense District (ADD), which defend most of the strategically significant targets, located in the interior of the USSR.
- At the same time, the new Air Defense Commands will give the High Command of a Theater of Military Operations more direct control over all air defense assets that will take part in the air battle in the theater.
- Moreover, it gives the commander of a peripheral MD more latitude to plan and coordinate air defense operations of all military forces within the MD.

We assume that the decisions about how air defense assets will be used will be made in the context of plans approved by the General Staff.

In addition to providing cover for military forces and facilities in the immediate area, the Soviets perceive the national and Soviet air defense forces in Eastern Europe as an integral component of a forward defensive barrier against large numbers of bombers and cruise missiles targeted against the USSR. All of the Pact national air defense forces are part of the Unified Air Defense System enabling Soviet and other Pact forces to gather and exchange air surveillance data and providing a centralized means to coordinate and direct operations. Moreover, recent organizational changes have been made that parallel those implemented in the USSR. Thus, the command and control apparatus for the employment of non-Soviet Warsaw Pact air defense forces by the Soviets for forward defense is in place.

[ ]deployment of some homeland-based strategic air defense assets beyond Soviet borders to support theater operations. Some strategic air defense units also might be moved forward to protect territory captured by Warsaw Pact forces, and[ ] to engage bombers and cruise missiles targeted against the USSR[ ]

Operations in Various Stages of Conflict

Although it is estimated that air defense forces would take seven to 14 days to fully mobilize to Full

Combat Readiness, 85 percent of the operational fighter force and 90 percent of all radar sites could be fully combat ready at Alert Posture One in two hours; 90 percent of all operational SAMs could be fully combat ready at Alert Posture One in three hours. This heightened state of alert can be achieved without imposing a higher readiness stage on all Soviet military forces. Although the air defense command and control system is largely ready in peacetime, the Soviets plan to further strengthen it for wartime operation by improving its survivability and expanding its coverage. The augmentation of command posts and the establishment of alternate command posts can be accomplished within 24 hours, and a backup net could be established in 24 to 48 hours.

As tensions rose, air defense forces probably would increase their alert posture and maintain a percentage of the force at the highest readiness level. We expect the Soviets to recall reserve personnel, fill understrength units, activate units for deploying reserve stocks of equipment, and make at least initial preparations for movement of SAM units and some EW radars and for the dispersal of fighter units to preselected alternate airfields.

Soviet strategic air defense elements would be involved in combat if conventional conflict spread to the USSR or if some strategic air defense forces were deployed to Central Europe or another theater in support of theater operations. As serious shortfalls in defense could occur if the Soviets were forced to use too much of their traditional strategic air defense resources outside of the USSR, they would probably be selective in drawing on these resources so as not to seriously weaken the overall air defense network or defense of any one geographic area.

A massive nuclear attack on the Soviet Union would degrade Soviet air defenses and would also create a hostile physical environment for the operation of both air defenses and an attacking bomber/cruise missile force. Defense effectiveness also would be degraded by operational factors such as the low-altitude, defense-avoidance, and electronic countermeasure (ECM) tactics of the attacking force. The Soviets probably would employ ground- and air-based jammers against navigation radars of bombers and cruise missiles, a tactic that could force bombers to higher altitudes where the Soviet defenses would be more effective. Some Soviet SAM units would probably use nuclear warheads.

The Soviets clearly intend to attempt to reconstitute elements of their air defense forces that have become inoperable in wartime, either through enemy action or equipment breakdown, thus continuing air defense operations in a protracted conflict. Although little is known of Soviet capabilities to conduct homeland air defense operations in a protracted conflict, Soviet air defense units plan to restore airfields by replacing damaged radar equipment, reestablishing communications, repairing runways, and clearing debris. Fighters would operate from alternate airfields when possible. Stocks probably are available for SAM units that would enable them to continue operations beyond a short period.

Exercises and Training

The vast bulk of Soviet air defense fighter training takes place at the operational regiments and involves simple forward-hemisphere head-on and rear-hemisphere tail-chase intercepts conducted at about the same altitude as the target. This is dictated by limitations of most currently deployed fighters and weapon systems and also reflects the training of minimally skilled pilots in basic intercept procedures. Fighter pilots have a high degree of success with the head-on and tail-chase tactics. They are much less successful

during side-on approaches; only the most experienced fighter pilots are successful in this tactic.

The Soviets have historically placed great importance on ECM training for personnel who operate SAM systems. Simulators are available to train SA-2 and SA-3 personnel. When these older SAM units encounter jamming aircraft using ECM, the unit will attempt to reduce the impact of the jamming by using the ECCM features of its radars.

Newer SAM systems, such as the SA-10 and SA-X-12, probably have more sophisticated ECCM, some of which may be automatic or semiautomatic, requiring less simulation training.

Implications of Peacetime Operations for Combat Effectiveness

There have been several events during this period—usually precipitated by Western reconnaissance aircraft or off-course airliners as in the 1978 and 1983 KAL incidents—in which the Air Defense Forces have had to react to unusual situations. In these situations, the air defense system generally performed poorly, raising questions about its potential combat effectiveness.

These incidents provide unique "real world," spontaneous tests of the Air Defense Forces and hence have implications for combat effectiveness. Because these incidents occurred in separate geographic areas over a long period, we conclude the problems these incidents revealed are not aberrations, but rather are characteristic of the Soviet air defense system. As such, they can be expected, in some degree, to surface in wartime.

Although in wartime Soviet air defenses would be at full alert, the improved readiness probably would be offset to some degree by other considerations. In the peacetime incidents, the Soviets were able to concentrate their efforts against single unarmed targets that were not attempting to evade detection. In wartime, targeting requirements would be vastly more complicated. The Soviets would have to deal with multiple targets—some or all of which would be flying at very low altitudes and employing various evasive measures. Electronic countermeasures, cruise missile attacks, and attacks designed to suppress the air defenses would be likely as well. These considerations, together with the performance of Soviet air defenses in the observed peacetime incidents, suggest that, in wartime, their air defense operations would be considerably degraded over what could be expected from assessing the nominal technical capabilities of their equipment and with nominal operational and command and control capabilities. Finally, the actual wartime environment, including the actions of the attacker, make assessments of the net result complex, and we have not attempted such an evaluation here.

An alternative view, while agreeing with the main text that actual operational performance of any military force most likely will not match assessed nominal technical capabilities, holds that the main text overstates the implications of these incidents for wartime Soviet air defense combat effectiveness. The failures ascribed to the Soviet air defense system stem primarily from the peacetime posture of the Soviet forces when they had no reason to believe hostile intent. During a crisis period or actual hostilities, however, the Soviets, in addition to being at higher readiness levels, would have a quite different mindset. Under these circumstances, the holders of this view believe the Soviets would be more likely to anticipate nonroutine situations, and their reactions to them would be markedly improved over those observed during peacetime.[5]

[5] *The holders of this view are the Director, Defense Intelligence Agency; the Director, National Security Agency; the Assistant Chief of Staff, Intelligence, Department of the Air Force; and the Assistant Chief of Staff for Intelligence, Department of the Army.*

Future Soviet Air Defense Forces

Technologies for Advanced Soviet Air Defense Systems

Signal processing—digital and optical—and directed energy are among key technologies in the development of advanced military systems for Soviet strategic air defense. Other important technologies for development and deployment of a smaller number of air defense system options include electro-optic and radar sensors, computing, and structural material.

The acquisition of Western technology by the Soviets is expected to shorten the time needed to make certain technologies available for application in weapons development. The Soviets are becoming more selective in the acquisition of Western military-related technology than in the past, choosing carefully the Western designs, engineering approaches, and equipment most appropriate to their specific technology needs. A key element in the selection process is the use of Western data bases to identify basic research and applications of key technologies. The most important air-defense-related technologies targeted for legal and illegal acquisition by the Soviets are microelectronics, computers, signal processing, and improved production capabilities, such as computer-aided manufacturing.

Radars

The Soviets are now deploying and have in development radars with the following improved capabilities over older systems in the operational inventory:

- Better clutter rejection.
- The ability to detect and track small targets with radar cross sections of 0.01 square meter or less.
- The capability to provide range, altitude, and azimuth information without a separate height-finding radar—a feature that is especially useful for support of ground-controlled intercepts.

Deployment of radars with these enhancements over the next 10 to 20 years will gradually improve the currently limited overall capability of the Soviet air defense surveillance and control forces to detect small targets at low altitude.

AWACS

We expect that the Mainstay AWACS aircraft, under development since at least 1972, will achieve IOC in 1986. It will be assigned the primary mission of defending the national airspace against massed bomber and cruise missile attacks, while also performing theater and maritime operations. It will provide the Soviets with new potential to extend early warning coverage—and, inherently, fighter intercept operations—beyond the range of ground-based radars and GCI. AWACS information on the low-altitude air battle situation will be particularly important.

The nature of future AWACS operations will depend on the target-handling capability of the Mainstay and on the coverage that the Soviets hope to achieve with an AWACS fleet. We have little evidence on Soviet acquisition plans for this complex aircraft; differing views on Soviet plans and requirements lead to estimates of the number of Mainstays required ranging from 30 to 60 aircraft. So far, we have identified 10.

In an air-to-air role, the Mainstay is probably capable of working with all current and projected fighter aircraft. It will probably achieve its highest degree of effectiveness when used with the Foxhound. The Foxhound will be able to perform as an extension of AWACS because it is equipped with an air-to-air data link as well as with ground-to-air and air-to-ground equipment.

The Soviets probably perceive a requirement for a smaller AWACS or AEW aircraft to support maritime and battlefield operations. In June 1985, a modified Coaler short-takeoff-and-landing jet transport that has a rotodome was observed at the Kiev airframe plant. This is probably a prototype intended for testing a tactical and naval configuration. An aircraft with the capabilities for these missions will probably become operational in the early 1990s.

Other Airborne Radars

A potential Soviet response to low-altitude bombers and cruise missile penetration—and one discussed in the Soviet military encyclopedia—could be the development and deployment of aerostat-borne early warning radars. Aerostat-borne radars:

- Are not constrained by terrain masking as are ground-based radars.
- Are less expensive than AWACS and are not as encumbered by fuel and airfield requirements.

However, operations of aerostat-borne radars could be hampered by bad weather.

Command and Control Systems

If the increased capabilities of future air defense systems are to be used to their fullest potential, more advanced command and control systems are required:

— A new ground-to-air data system is being deployed to supplement the current GCI system. The older system cannot work efficiently with new-generation fighters.

[redacted]

Air Defense Fighters

Flanker. The Flanker is a supersonic all-weather fighter designed primarily to perform air-to-air combat at medium-to-low altitudes but with the capability to conduct ground-attack missions as well. The Flanker will probably be assigned to the Air Defense Forces, the Air Forces of the Military District, and the theater-level Air Armies of Strategic Aviation.

The Flanker has lookdown/shootdown capabilities that are superior to those of the Foxhound for rear-hemisphere intercepts, but it does not have the Foxhound's multitarget capabilities. We estimate the Flanker has the capability to track more than one target but can only engage one target at a time.

A prototype Flanker probably entered flight-testing in 1977. Series production probably began in late 1983, but production has been hindered by problems with both engines and radars. [redacted] We estimate that the Flanker will become operational in 1986. Nine Flankers have been seen with an operational unit at the airfield near the Flanker production facility at Komsomolsk.

Advanced Fighters. Future Soviet fighters are likely to be more flexible and more complex than currently fielded weapons, with fewer types developed and produced in smaller quantities than has been previous Soviet practice. Because the Soviets have integrated their tactical and strategic fighter forces, most future fighters will probably be capable of air-to-ground as well as air-to-air missions.

Soviet attempts over the next 15 years to improve the aircraft of their interceptor force are likely to follow the same two-track approach that has served them so well over the past three decades. This approach, which involves fielding new variants of existing aircraft as well as developing completely new designs, allows the Soviets to continuously modernize their interceptor force without being totally dependent on new designs that have a higher probability of running into development problems.

We expect the Soviets to develop up to three new fighter aircraft over the next 10 to 15 years. We have evidence that the Sukhoy design bureau is working on a new aircraft, but we are uncertain if this new aircraft will be a fighter.

Surface-to-Air Missiles

SA-5. The Soviets are probably designing a modernized variant of the SA-5 system. [redacted] modifications are being made to the seeker and to the Square Pair radar. [redacted]

By the mid-1990s, the SA-5 system is likely to have matured to the point where further modification will not be worthwhile, and an SA-5 follow-on system will probably be deployed. The mission of the SA-5 follow-on would be long-range defense primarily against medium- to high-altitude targets, although the system would possibly have a low-altitude capability approaching that of the SA-10. In addition, like the SA-10, the SA-5 follow-on radar would be capable of multiple simultaneous intercepts. The system's engagement range may be 400 km or more. An alternative view holds that the range of the SA-5 follow-on will be limited to 300 to 350 kilometers.[6]

SA-10b. The Soviets will soon deploy a mobile version of the SA-10 (the SA-10b). The Soviets have not yet had a fully mobile strategic SAM, although tactical SAMs with similar mobility have been available for air

[6] *The holder of this view is the Assistant Chief of Staff, Intelligence, Department of the Air Force.*

defense of theater forces for some time. Confirmation of the most likely mission for the SA-10b will have to await initial deployment of the system. The SA-10b has the potential to provide:

- A mobile adjunct to older strategic SAMs in point and barrier defense of strategic facilities.
- An air defense for mobile offensive strike and command, control, and communications assets.
- Wartime augmentation of tactical SAMs in defense of theater strategic forces beyond the USSR's borders.

The redeployment of large numbers of SA-10b's to unprepared field locations during a crisis would complicate US/NATO defense suppression and avoidance tactics.

We are uncertain whether the low-altitude acquisition radar used by the transportable SA-10a will be part of an SA-10b unit. Without this radar, the SA-10b's engagement range against low-altitude targets compared with that of the SA-10a would be seriously diminished.

We judge that the Soviets are currently modifying the SA-10 to improve its performance against cruise missiles.

SA-11. The Soviets are testing a modernized SA-11 system.

Use of an electronically steered array on the SA-11 could markedly improve the system by allowing each TELAR to engage more than one target simultaneously.

SA-X-12. The SA-X-12 is a modern, sophisticated, long-range tactical system that probably will supplement or replace the SA-4 and significantly enhance Front/Army defense of Soviet ground operations against a number of US weapon systems. Operating one on one, the SA-X-12 will provide the following capabilities:

- Excellent capability against high-performance aircraft.
- Excellent capability against standoff or surveillance aircraft.
- Good capability against low-altitude penetrators.
- Good defense in the presence of current-generation US ECM.
- Defense against US tactical ballistic missiles—Lance, Pershing I, and Pershing II—and those of other countries.

Directed-Energy Air Defense Weapons

Air defense laser weapons will complement rather than replace fighters and SAMs. Initial ground-based air defense laser weapon systems would probably have engagement ranges of 1 to 10 kilometers. A barrier defense role for these laser weapons seems impractical because of the large number of units that would be required; a point defense role for high-value targets appears more practical. The laser weapon has an inherent capability to handle multiple engagements in a short time, a desirable quality for point defense when high target-arrival rates are expected.

The Soviets appear to be developing two high-energy laser weapon systems with potential strategic air defense applications—ground-based and naval point defense. Such weapons could be used to damage sensors at long ranges and to cause physical damage at short ranges We estimate that, with high priority and program successes, deployment of such weapons could occur within the next 10 years.

In addition to these systems, the Soviets probably have other high-energy laser air defense programs under development. One of these programs probably involves the development of a dedicated tactical mobile laser vehicle at Golovino.

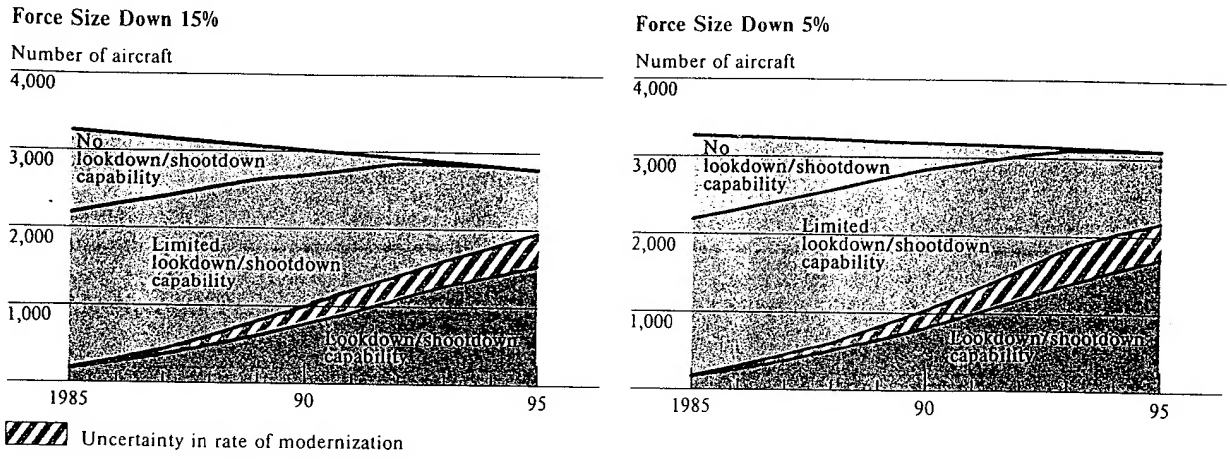
Naval Forces for Air Defense

Improvements to naval air defense forces are expected in a number of areas:

- Improved data processing is expected for air search radars to facilitate shipboard-controlled air intercepts.
- A long-range follow-on to the SA-N-6 naval SAM would be part of an integrated surface-to-air weapon system similar to the Western Aegis.
- Naval laser weapons will improve short-range air defense.

Electronic Warfare Programs

Figure 3
Projected Soviet Homeland-Based Fighter Aircraft



Secret

307876 1-86

Projections

We have constructed a series of projections for the major elements that will constitute the air defenses deployed in the USSR through the mid-to-late 1990s. The projections represent broad trends based on a body of evidence on Soviet weapons development programs and data on Soviet testing, production, and deployment practices. The elements projected are:

— Ground-based radars.

— Fighters.

— Strategic SAMs.

— Tactical SAMs. (s)

Moreover, the Soviets have the potential to introduce their newer air defense systems into the forces at different rates. To demonstrate this range, we have assumed that new systems will constitute one of two different percentages of the total 1995 force for each force element. The choice of the percentage modernization includes consideration of the overall size of the force element and historical modernization trends for that element. (s)

We have projected by 1995:

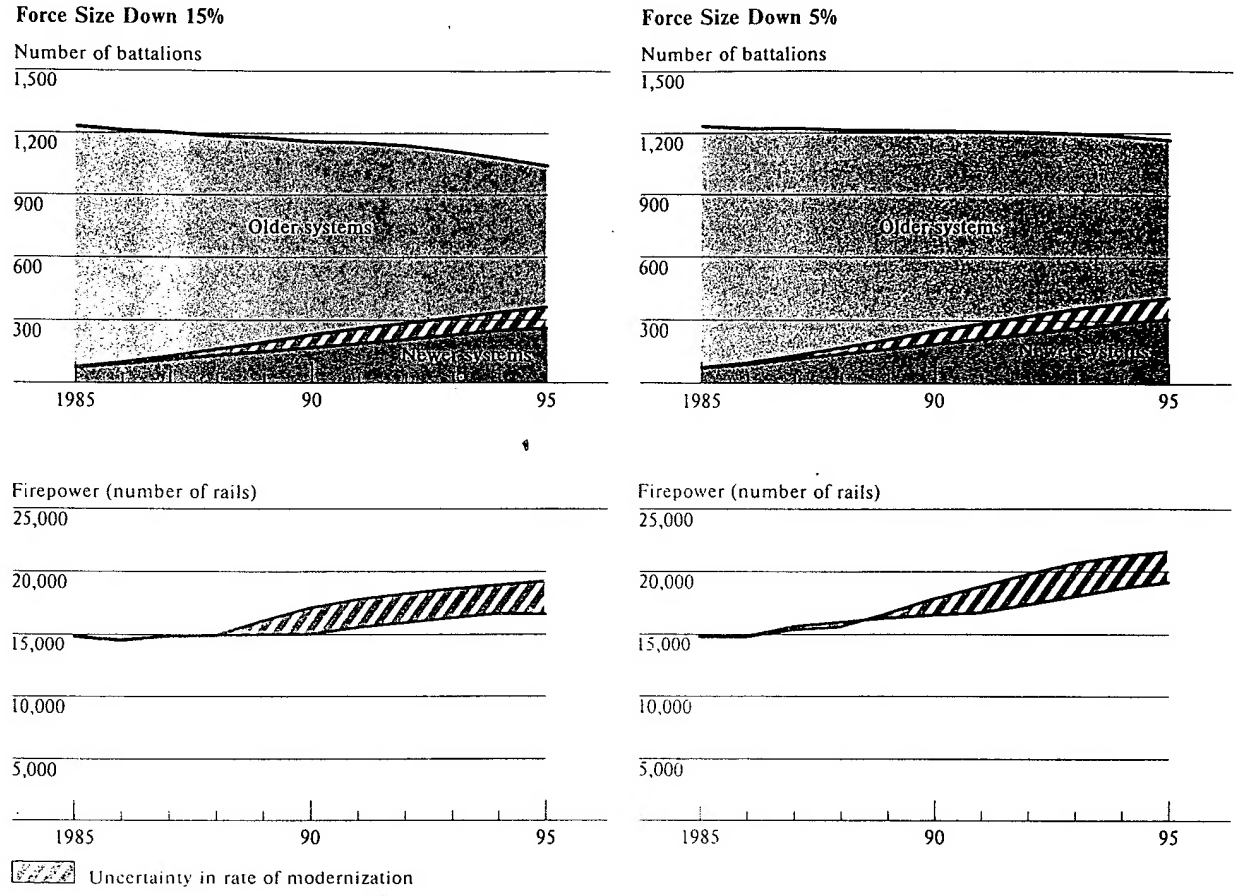
— The number of *ground-based radars* will be less—we estimate by 5 or 10 percent—because of the ability of newer three-dimensional radars to perform the functions of both early warning and height-finding radars. We estimate the modernization rate will be 25 to 35 percent—about 2,000 to 3,000 new radars.

— The *fighter force* will be 5 to 15 percent smaller, continuing the downward trend in force size. We estimate the modernization rate will be 55 to 70 percent—about 1,400 to 2,000 new fighters (see figure 3).

— The *strategic SAM force* will have 5 to 15 percent fewer SAM battalions—though it has remained constant over the past 10 years—because the SA-10 system, with better capabilities than the SA-1, SA-2, and SA-3 will replace them at less than a one-for-one rate. We estimate the modernization rate will be 25 to 35 percent—about 200 to 350 new battalions (see figure 4). The firepower of these units, however, will be much greater, resulting in an increase in firepower for the force from 5 to 60 percent higher than that of the current force, also shown in figure 4.

— The *tactical SAM force* will grow in size, continuing the trend of replacing AAA with SAMs in

Figure 4
Projected Soviet Strategic Surface-to-Air Missile Forces



Secret

307877 1-86

ground forces units. The overall force size, however, will not grow as dramatically as in the past; we estimate 5 to 15 percent more SAM batteries. We estimate the modernization rate at 40 to 60 percent—about 200 to 400 new batteries. The firepower of the future tactical SAM force will be 40 to 90 percent higher than that of the current force. (s)

Projection of two other air defense elements is inherently more uncertain:

— *Directed-energy weapons* are yet to reach IOC and, therefore, have no deployment history. Moreover, all such weapons would be considered new. We project that there could be some 50 to 200 tactical and strategic directed-energy weapons deployed by 1995.

— *Airborne air defense support systems*—such as Mainstay, tankers, and aerostats—are either not yet deployed or are deployed in small numbers so that historical force size trends are not meaningful. We project some 30 to 60 Mainstay AWACS aircraft and 100 to 180 tankers will be deployed by 1995. (s)

Certain trends in Soviet air defense forces are clear:

— The Soviets will continue a steady modernization, replacing or improving many of their current air defense weapons and support systems with new or modernized systems by the mid-1990s.

— The firepower of Soviet air defenses will grow during the next decade as more capable systems are fielded.

— Soviet ground-based air defenses will become increasingly mobile, thus complicating suppression and avoidance tactics. (s)

[redacted]